

## REMARKS

Applicants respectfully request reconsideration of the present application in view of the foregoing amendments and in view of the reasons that follow.

### **Status of Claims:**

Claims 2-5, 7-11, 13, and 15-22 are pending in the application. New claims 20-22 are currently added. Support for claims 20-22 can be found in the application as originally filed, *inter alia*, in paragraph 0028. No new matter is added.

Applicants acknowledge, with appreciation, the PTO's withdrawal of the § 103(a) rejection over Noda.

### **Claim Rejections – 35 U.S.C. § 103:**

Claims 2-5, 7-11, 13, and 15-19 were rejected under 35 U.S.C. § 103(a) as being allegedly unpatentable over Noda *et al.* (hereafter "Noda"), U.S. Patent No. 6,905,963 in view of Yamazaki *et al.* (hereafter "Yamazaki"), U.S. Publication No. 2002/0151120. Applicants respectfully traverse this rejection for at least the reasons set forth below.

### **Noda and Yamazaki Do Not Disclose All Claim Limitations**

Noda and Yamazaki, alone or in combination, fail to disclose, teach, or suggest a semiconductor device fabricating method that achieves an average concentration of boron atoms in the polysilicon between  $7 \times 10^{20}$  and  $3 \times 10^{21}$  boron atoms per cubic centimeter as required in the presently claimed invention. Noda is silent on an average concentration of boron within the polysilicon. Yamazaki discloses that the "concentration of phosphorus necessary for gettering is equal to or greater than  $1 \times 10^{20}/\text{cm}^3$ " and during a third doping process "the concentration of boron becomes  $6 \times 10^{19}$  to  $6 \times 10^{20}/\text{cm}^3$ ." Yamazaki, paragraphs [0009] and [0123]. Applicants respectfully note that the concentration of phosphorous is not interchangeable with the concentration of boron, and therefore is not applicable to the presently claimed invention, because phosphorous is an n-type dopant and boron is a p-type dopant. Furthermore, Yamazaki discloses a concentration of boron between

$6 \times 10^{19}$  and  $6 \times 10^{20} \text{ cm}^3$ , which is less than the range of  $7 \times 10^{20}$  to  $3 \times 10^{21} / \text{cm}^3$  of the presently claimed invention. Therefore, even if Noda and Yamazaki were combined, the combination would still not teach a range of  $7 \times 10^{20}$  to  $3 \times 10^{21} / \text{cm}^3$  recited in independent claims 17, 18 and 19.

### **Unexpected Results**

Applicants further note that the concentration range of boron as presently claimed provides unexpected results over Noda and Yamazaki. As stated in the declaration of S. Brad Herner, Ph.D., dated April 24, 2007, and enclosed with the prior Amendment, generally, as the boron concentration in silicon increases, the resistivity decreases. Herner declaration, paragraph 3. However, Applicants unexpectedly discovered that “when the boron concentration exceeds  $3 \times 10^{21}$  boron atoms/ $\text{cm}^3$ , resistivity of *in situ* boron-doped silicon begins to increase again.” *Id.*

Thus, Applicants discovered that when silane and  $\text{BCl}_3$  are flowed simultaneously to deposit a polysilicon layer at a relatively low temperature, a minimum resistivity can be achieved if the boron concentration is in a range of  $7 \times 10^{20}$  to  $3 \times 10^{21} / \text{cm}^3$ . In other words, if boron concentration was plotted against resistivity, a minimum or trough in resistivity would be observed for boron concentration in a range of  $7 \times 10^{20}$  to  $3 \times 10^{21} / \text{cm}^3$ . This result is unexpected and is not suggested by Noda or Yamazaki. Evidence of unexpected results is pertinent to the conclusion of nonobviousness. See generally, MPEP § 716.02 (a). Thus, claims 17-19 are unobvious because the claimed method achieves an unexpected result.

For at least these reasons, Applicants submit that the rejection based upon Noda and Yamazaki is improper and should be withdrawn. If an independent claim is nonobvious under § 103, then any claim depending therefrom is nonobvious. *In re Fine*, 5 USPQ2d 1596 (Fed. Cir. 1988). See MPEP 2143.03. Thus, Applicants submit that claims 2-5, 7-11, 13, and 15-16, each of which ultimately depends from independent claim 17, are also non-obvious at least by virtue of their dependency from claim 17. In view of the foregoing, Applicants respectfully request reconsideration and withdrawal of the rejection under § 103.

### **Newly Added Claims**

In this response, Applicants have added claims 20-22 which depend from claims 17-19, respectively. Applicants believe that claims 20-22 are allowable by virtue of their dependency from one of independent claims 17-19 and also because of the additional features recited in each claim.

**Conclusion:**

Applicants believe that the present application is now in condition for allowance. Favorable reconsideration of the application as amended is respectfully requested. The Examiner is invited to contact the undersigned by telephone if it is felt that a telephone interview would advance the prosecution of the present application.

The Commissioner is hereby authorized to charge any additional fees which may be required regarding this application under 37 C.F.R. §§ 1.16-1.17, or credit any overpayment, to Deposit Account No. 19-0741. Should no proper payment be enclosed herewith, as by a check or credit card payment form being in the wrong amount, unsigned, post-dated, otherwise improper or informal or even entirely missing, the Commissioner is authorized to charge the unpaid amount to Deposit Account No. 19-0741. If any extensions of time are needed for timely acceptance of papers submitted herewith, Applicants hereby petition for such extension under 37 C.F.R. §1.136 and authorizes payment of any such extensions fees to Deposit Account No. 19-0741.

Respectfully submitted,

Date

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By



FOLEY & LARDNER LLP

Customer Number: 22428

Telephone: (202) 945-6090

Facsimile: (202) 672-5399

Leon Radomsky

Attorney for Applicants

Registration No. 43,445